

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)


(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference		FOR FURTHER ACTION	
International application No. PCT/GB2004/003077		International filing date (day/month/year) 14.07.2004	Priority date (day/month/year) 21.08.2003
International Patent Classification (IPC) or national classification and IPC C08J9/20, C08J9/14			
Applicant BP CHEMICALS LIMITED et al.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 9 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> sent to the applicant and to the International Bureau) a total of sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (Indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input checked="" type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand 08.03.2005		Date of completion of this report 30.08.2005	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer Öhm, M Telephone No. +49 89 2399-	



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/GB2004/003077

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

Description, Pages

1-22 as originally filed

Claims, Numbers

1-26 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/GB2004/003077

Box No. IV Lack of unity of invention

1. ☐ In response to the invitation to restrict or pay additional fees, the applicant has:
- ☐ restricted the claims.
 - ☐ paid additional fees.
 - ☐ paid additional fees under protest.
 - ☐ neither restricted nor paid additional fees.
2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is
- ☐ complied with.
 - ☒ not complied with for the following reasons:
see separate sheet
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☒ all parts.
 - ☐ the parts relating to claims Nos. .

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	12-14,16,17
	No: Claims	1-11,15,18-26
Inventive step (IS)	Yes: Claims	13,16
	No: Claims	1-12,14,15,17-26
Industrial applicability (IA)	Yes: Claims	1-26
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Reference is made to the following documents:

- D1: EP-A-0 987 293 (SHELL INT RESEARCH) 22 March 2000 (2000-03-22)
- D2: FR-A-2 780 406 (BP CHEM INT LTD) 31 December 1999 (1999-12-31)
- D3: WO 96/15182 A (SHELL INT RESEARCH) 23 May 1996 (1996-05-23)

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-11, 15 and 18-26 is not new in the sense of Article 33(2) PCT.

D1 discloses a process for the preparation of porous polystyrene particles containing 0.5 to 4 % by weight of a blowing agent and having an apparent density of 600 to 200 kg/m³ (claims 8 and 6). The process includes an aqueous suspension polymerisation (claim 9). The blowing agent can be added before, during or after the polymerisation (claim 9). It is preferably pentane (column 9, example 1). In example 1, 0.25 wt.-% white oil are included in the composition during polymerisation. The obtained particles have a particle size in the range of 0.4-0.7 mm. In example 4, column 10, particles expanded to a bulk density of 125 kg/m³ are obtained. The particles of D1 are pre-expanded particles (column 2, lines 53-55) which are used for the production of moulded articles (claim 12).

Hence D1 is novelty-destroying for claims 1, 3-11, 15 and 18-26.

D2 describes a polystyrene composition in the form of beads comprising (a) 100 parts by weight of a styrene polymer having a mean molecular mass M_w of 150000 to 300000, (b) 2-9 parts by weight of a blowing agent comprising n-pentane, (c) 0.1 to less than 1.0 parts by weight of a paraffin wax (claim 1). A process for preparing said composition comprising a polymerisation in aqueous suspension in the presence of the paraffin wax and the blowing agent is also disclosed (claim 16). The blowing agent can be introduced at a moment corresponding to a conversion rate of styrene

of from 0 to 95 %.

Thus claims 1-6 and 9-11 are not new compared to D2.

D3 discloses expandable polystyrene beads containing 3 to 4.9 wt-% of a blowing agent and 0.1 to 4 wt-% of a plasticizer (claims 1, 3, 7). A process for preparing said beads by polymerising styrene in aqueous suspension in the presence of the plasticizer and adding the blowing agent to the suspension before, during and/or after the polymerisation is also disclosed (claim 8). Pentane is the preferred blowing agent (page 5-6, examples 1-4). The weight average molecular weight M_w of the polystyrene is from 185000 to 300000 (page 3, lines 18-19) and the particle size of the beads is from 0.7 to 1.2 mm (page 5, lines 16-17).

Therefore, D3 takes away the novelty of claims 1-4, 6, 7 and 9-11.

3. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 12, 14 and 17 does not involve an inventive step in the sense of Article 33(3) PCT.

D1 is considered to represent the closest prior art. Claim 12 differs from D1 in that the process for manufacturing the expanded moulded polystyrene comprises a stabilisation stage carried out by contacting the pre-expanded beads with a gaseous medium at a temperature of from 0 to 40 °C under an absolute pressure of from 50 to 160 kPa for a period of from 6 to 48 hours.

Claim 12 is therefore new.

No particular advantages resulting from said specific stabilisation stage are mentioned in the application. The problem to be solved by the present invention can therefore be regarded as providing alternative processes for the preparation of medium-density expanded moulded polystyrene objects.

It is, however, generally known that expandable particles usually pass such a stabilisation stage before being moulded. As an example, D3 reports on page 5, lines

34-35, that the pre-expanded beads are allowed to mature overnight in an air-permeable silo, which implies standard conditions (room temperature and pressure).

Claim 12 therefore lacks an inventive step.

The same applies to claim 14 which only specifies the density of the beads obtained in the pre-expansion step.

Claim 17 differs from D1 in that the molecular weight of the polystyrene is specified. A molecular weight of 150000 to 300000 is however common in the art of styrene polymers, see e. g. D2 or D3.

Therefore, claim 17 does not involve an inventive step as well.

4. The combination of the features of dependent claims 13 or 16 is neither known from, nor rendered obvious by, the available prior art. The reasons are as follows: For achieving a bulk density in the range presently claimed, D1 uses two expansion steps. No process comprising a single pre-expansion stage for achieving a density of 40 to 190 g/l is disclosed in D1. Hence claim 13 is new.

According to the applicant, the process of the present invention shows the advantage of avoiding multiple pre-expansion and stabilisation stages and is hence cost effective and less complex than prior art processes. The problem solved by the present invention can thus be regarded as providing a cost effective and simple process for the preparation of medium-density expanded moulded polystyrene objects.

D2 and D3 both disclose a single pre-expansion stage (D2: page 19, lines 1-6; D3: page 5-6, examples 1-4), but the beads obtained therein have a density of from 13.3 to 16.3 kg/m³ in D2 (page 19, table 1) and between 17.8 and 20.7 in D3 (page 7, table 1) and are thus not suitable to obtain medium-density expanded moulded objects.

Claim 16 differs from D1 in that the pre-expanded beads are expandable without the

addition of a fresh quantity of blowing agent and is thus also new.

Avoiding an impregnation of the polystyrene beads with a fresh quantity of blowing agent also solves a problem to provide a simple and cost-effective production process of expanded polystyrene articles.

D3 discloses pre-expanded beads which are expandable without the addition of further blowing agent (page 4, lines 13-14). However, it is assumed that the combined teaching of D1 and D3 would not enable the skilled person to produce pre-expanded beads of medium density which are expandable without the addition of further blowing agent, as D3 is not directed to beads of such a density and does not include any hint how to modify its teaching in order to obtain such particles.

Re Item IV

Lack of unity of invention

1. This Authority considers that there are 2 inventions covered by the claims indicated as follows:
 - I: Claims 1-11 and 26 (partly) directed to expandable polystyrene beads comprising 100 parts of a polymer of styrene, 2.2 to less than 4.0 parts of a blowing agent and 0.01 to 0.4 parts of a plasticising agent.
 - II: Claims 12-25 and 26 (partly) directed to the use of pre-expanded polystyrene beads comprising a blowing agent and having a bulk density of from 40 to 190 g/l for manufacturing medium-density expanded moulded polystyrene objects.
2. The reasons for which the inventions are not so linked as to form a single general inventive concept, as required by Rule 13.1 PCT, are as follows:

The common inventive concept of the first and the second invention is the use of polystyrene expandable beads comprising 100 parts by weight of polystyrene and a blowing agent. Such expandable beads are, however, already disclosed in D1 to D3

(cf. 2. under item V).

3. The prior art has been identified as document D1 to D3, cf. passages cited above.

It follows that the following technical features of claims 1-11 and 26 (partly) make a contribution over the prior art and can be considered as special technical features within the meaning of Rule 13.2 PCT: None, as claims 1-11 and 26 are not new (cf. 2. under item V).

The following technical feature of claims 12-14 makes a contribution over the prior art and can be considered as a special technical feature within the meaning of Rule 13.2 PCT: A single pre-expansion stage is used.

The problem solved by this special technical feature can therefore be construed as providing a cost effective and simple process for the preparation of medium-density expanded moulded polystyrene objects (cf. also 4. under V).

The following technical feature of claims 15-25 and 26 (partly) makes a contribution over the prior art and can be considered as a special technical feature within the meaning of Rule 13.2 PCT: The pre-expanded beads are characterised in that they are expandable without the addition of further blowing agent.

The problem solved by this special technical feature can therefore be construed as providing a cost effective and simple process for the preparation of medium-density expanded moulded polystyrene objects, as well.

Therefore, the special technical feature of claims 12-14 is not equal to the special technical feature of claims 15-25 and part of claim 26. However, as both special technical features solve the same problem, they are regarded to be corresponding technical features.

As claims 1-11 and 26 (partly) are not new, they do not provide any special technical feature at all and thus do not share any common or corresponding special technical feature with claims 12-25 and 26 (partly).

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.

PCT/GB2004/00307Z

4. In conclusion, the groups of claims are not linked by common or corresponding special technical features and define 2 different inventions not linked by a single general inventive concept.

The application, hence does not meet the requirements of unity of invention as defined in Rules 13.1 and 13.2 PCT.